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Narrative Biocriteria Standard Implementation Procedures For Wadeable, Perennial Streams

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Water Quality Division
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Surface Water Quality Standards & Monitoring Unit

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Executive Summary

This document sets forth implementation procedures for the proposed narrative "Biocriteria" water quality standard. The document provides a narrative biocriteria statement and explains ADEQ's approach to determining compliance with this new standard in an objective way. The document also describes how ADEQ will use the narrative biocriteria standard in the §305(b) water quality assessment and §303(d) listing processes.

The proposed biocriteria standard for wadeable, perennial streams of Arizona consists of a narrative statement, the associated Index of Biological Integrity scores for cold and warm water streams, and a statement of applicability to various waterbody types. The following narrative statement is the proposed language for the narrative biocriterion.

"The biological integrity of a wadeable, perennial stream, as determined by the Arizona Indexes of Biological Integrity (IBI), shall be protected at or above the 25th percentile of reference condition."

Index of Biological Integrity scores for the macroinvertebrate assemblage, associated with the 25th percentile of reference condition, comprise the proposed biocriteria thresholds by which to implement the narrative and are presented in this document. Study site scores must be greater than or equal to the IBI threshold to meet the standard.

This narrative standard is intended to protect aquatic life uses of surface waters in Arizona. However the narrative biocriterion will only be applied to perennial, wadeable stream segments with warm or cold water aquatic life designated uses at this time, because methods have only been developed for this waterbody type to date.

ADEQ will assess the appropriate aquatic life use based on a macroinvertebrate sample collected from a wadeable, perennial stream with fast-flowing riffle or run habitat with heterogeneous substrate that is collected during the appropriate spring index period. These conditions are explained in this document. The warm water IBI will apply to perennial, wadeable streams found at <5000' elevation and the cold water IBI will apply to perennial, wadeable streams found at >5000' elevation. ADEQ methods for biological sample collection and data analysis must be followed to apply these macroinvertebrate-based IBIs.

For assessment purposes, ADEQ proposes to use the 25th percentile of reference condition as the minimum threshold needed to attain the biocriteria standard. A verification sample will be required when the IBI score falls in the inconclusive zone between the 10th and 25th percentiles of reference condition. When the IBI score for the verification sample falls below the 25th percentiles, the study reach will be assessed as impaired for the aquatic life use.

A waterbody will be placed on the 303(d) impaired waterbody list when the IBI score is less than the 10th percentile for a single sample. A waterbody will also be placed on the 303(d) list when an initial IBI score is found to be inconclusive (between the 10-25 percentiles) and a verification sample is found to be less than the 25th percentile.

Acknowledgments

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Introduction

The Environmental Protection Agency (USEPA) has been urging states to develop bioassessment methods and incorporate biocriteria into surface water standards since the Rapid Bioassessment Protocols were published (Plafkin et al, 1989). Biocriteria provide a direct measurement of biological integrity, one of the three objectives identified in the Clean Water Act. Bioassessment data are important for measuring the attainment of water quality standards for the protection of aquatic life because they utilize surveys of resident living organisms. Bioassessment data can provide a clear picture of whether a waterbody is meeting its designated aquatic life use and can validate whether existing water quality criteria for toxic chemicals and habitat quality are adequately protecting that use (USEPA, 2002a).

Biological indicators such as macroinvertebrates, algae and fish integrate the cumulative effects of different stressors such as excess nutrients, toxic chemicals and excessive sediment over time. The biology provides a more reliable assessment of long-term ecological changes in the condition of a waterbody than do rapidly changing water chemistry measurements or laboratory toxicity tests. As such, the biota provides a unique indicator of ecological health, unlike any other measurement. The USEPA recommends that states use biological assessment data as a core indicator for making aquatic life use determinations, where states have addressed the critical technical elements for an adequate bioassessment program and have documented an adequate level of rigor (Barbour and Yoder, 2004).

Background

The concept of biological integrity is embedded in the statutory and regulatory structure of Clean Water Act 101(a). The objective of the Clean Water Act is "to restore and maintain the chemical, physical, and biological integrity of the nation's waters." Section 101(a)(2) sets forth the national goal that "…wherever attainable, an interim goal of water quality which provides for protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved." The intent of this statement is to protect not only what is currently living in our waters but also to provide for maintenance of viable, reproducing populations.

Biological integrity is commonly defined as "the capability of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity and functional organization comparable to that of the natural habitat of the region" (Karr and Dudley, 1981). This concept refers to the natural assemblage of indigenous organisms that would inhabit a particular area if it had not been affected by human activities. The naturally occurring biological diversity becomes the primary reference condition used to measure and assess attainment of aquatic life goals.

Biocriteria Program

ADEQ began a bioassessment program in 1992 following the USEPA Rapid Bioassessment Protocols for wadeable streams and rivers (Plafkin et al, 1989), which provided guidance for development of monitoring and assessment procedures. Standard operating procedures for macroinvertebrate monitoring in perennial, wadeable streams of Arizona and for laboratory processing and taxonomic identification were established and recently updated in the *Biocriteria Program Quality Assurance Program Plan* (ADEQ, 2005). A statewide reference site monitoring network was established to develop indexes of biological integrity as the macroinvertebrate bioassessment tool. Reference site monitoring continues annually in two basins per year, as described in the Comprehensive Statewide Monitoring Strategy (ADEQ, 2004).

A classification analysis was performed on the statewide macroinvertebrate dataset to identify regions of statistically different macroinvertebrate communities across the state (Spindler, 2001). Elevation-based regions were the result of the classification analysis, consisting of two broad macroinvertebrate regions and community types:

- A warm water community located below 5000 feet of elevation
- A cold water community located above 5000 feet of elevation

All wadeable, non-effluent dependent, perennial streams located in these regions, with some exceptions (see section on applicability) are predicted to have the same general macroinvertebrate community type. Indexes of Biological Integrity (IBI) were then developed for both a warm water community and a cold water community type, using Arizona's statewide network of reference site data (Gerritsen and Leppo, 1998; Leppo and Gerritsen, 2000). Background information about reference conditions and development of the IBIs is presented in Appendix A.

Narrative Biocriteria Standard

The proposed biocriteria standard for wadeable, perennial streams of Arizona consists of a narrative statement, the associated IBI scores for cold and warm water streams, and a statement of applicability to various waterbody types. The following narrative statement is the proposed language for the narrative biocriterion.

"The biological integrity of a wadeable, perennial stream, as determined by the Arizona Indexes of Biological Integrity (IBI), shall be protected at or above the 25th percentile of reference condition."

The IBI scores in Table 1 comprise the proposed biocriteria thresholds by which to implement the narrative. A sample IBI score must be greater than or equal to the 25th percentile of reference IBI threshold to comply with the narrative biocriteria standard. When a sample IBI score is less than the 10th percentile of reference condition, the sample has exceeded the standard and is impaired. When a sample IBI score falls between the 10th and 25th percentile of reference score,

the result is inconclusive and a verification sample is required. If the verification sample IBI score falls below the 25th percentile, the biocriteria standard is exceeded.

Table 1. Macroinvertebrate IBI thresholds for wadeable, perennial streams of Arizona

Macroinvertebrate bioassessment result	Index of Biological Integrity Score	
	Cold water	**Warm water**
Greater than the 25th percentile of reference condition	≥ 90	≥ 59
Between the 10th and 25th percentile of reference condition	86 – 89	53 – 58
Less than the 10th percentile of reference condition	≤ 85	≤ 52

ADEQ's biological data collection and analysis procedures must be followed in order to apply Arizona's macroinvertebrate IBIs. ADEQ field sampling and laboratory methods are described in the *Biocriteria Program Quality Assurance Program Plan* (ADEQ, 2005).

Applicability

The narrative biocriterion will only apply to perennial, wadeable stream segments with cold and warm aquatic life designated uses. The Arizona Water Quality Standards (A.A.C. Title 18. Chapter 11) currently list four aquatic life uses: aquatic life (cold water), aquatic life (warm water), aquatic life (ephemeral), and aquatic life (effluent-dependent). Developing biocriteria for the cold and warm water perennial streams have been the priority because of the diverse aquatic and terrestrial life they support and because aquatic communities of perennial streams have predictable community structure and function. Since biocriteria research efforts thus far have focused on these perennial, wadeable streams, the biocriteria standard will only apply to cold and warm aquatic life uses, at this time. ADEQ may revise the biocriteria standard and develop implementation procedures for other waterbody types as new scientific information becomes available.

In addition to perennial and wadeable, other stream conditions must be met in to apply the Arizona Indexes of Biological Integrity (IBI). The sampling site conditions and collection time frame must meet the following conditions:

- **Wadeable,**
- **Perennial,**
- **Contain fast-flowing riffle or run habitat,**
- **Contain heterogeneous substrates,**

- **Sampled during the spring index period** (April-May for warm water streams and May-June for cold water streams).

These conditions are important for determining that the study samples are collected from streams that are similar to the reference stream sites, and to prevent sample collections from habitats or during time periods when conditions would lead to a false finding of impairment. **Wadeable** means no deeper than can be safely waded across when collecting samples. **Perennial** refers to stream segments which flow continuously throughout the year (excluding effluent dependent waterbodies). **Riffle habitat** refers to the portions of streams where moderate velocities and substrate roughness produce moderately turbulent conditions which break the surface tension of the water and may produce whitewater (Bain and Stevenson, eds. 1999). **Run habitat** refers to segments of streams where there is moderate velocity water, but non-turbulent conditions which do not break the surface tension of the water and do not produce whitewater (Bain and Stevenson, eds.1999).

Heterogeneous substrate means a mixture of particle sizes comprising the stream bottom material that is less than 50% composed by travertine, bedrock or sand. Streams with *homogeneous* substrates, such as bedrock or sand have aquatic communities which exhibit limited taxa richness and loss of structure and function when compared with reference conditions.

The **spring index period** is defined as a period of time following winter runoff in which baseflow conditions will be found in most streams. Baseflow conditions generally are achieved post winter runoff in the desert streams in April-May and in mountain streams in May-June. A period of generally 4 weeks post-bankfull flood condition is required prior to macroinvertebrate sampling, even during the spring index sampling period. Hydrologic conditions are checked in the office prior to a site visit and field conditions are documented in the field prior to sampling confirm that sampling is occurring during the correct sample collection conditions (Appendix B).

The proposed narrative biocriterion will not apply to the following waterbody types until ADEQ adopts IBI scoring thresholds specific to these types of waters:

- **Effluent dependent waterbodies**
- **Intermittent streams**
- **Ephemeral streams**
- **Large rivers**
- **Lakes**
- **Wetlands**

Use of the Narrative Biocriteria Standard in §305(b) Water Quality Assessment and §303(d) Listing

Assessments

Assessments and impaired waters identification will be based on the macroinvertebrate community biocriteria in this document. A single macroinvertebrate sample will be used to determine if the aquatic life use is being met. There are several reasons why a single sample is appropriate for bioassessment.

- A single macroinvertebrate sample represents long-term conditions because the invertebrates reside in the stream year-round.

- The sampling method is sufficiently rigorous that it limits the amount of variability in sample collection. Precision of the indexes is high, with a standard deviation of only 7 points on a 100 point scale, for repeat visits across years in the warm water dataset (Gerritsen and Leppo, 1998). ADEQ's Biocriteria Program ranks as a Level 3 bioassessment program according to guidance provided in a draft USEPA document outlining the 14 critical elements of an adequate bioassessment program. The Consolidated Assessment and Listing Methodology guidance document (USEPA, 2002a) indicates that a Level 3 bioassessment program has a sufficient level of certainty to make an assessment of impairment of the aquatic life use.

- The Indexes of Biological Integrity are robust measures of the structure and function of the macroinvertebrate community, and limit the variability associated with a single metric.

- The reference condition, upon which the Indexes are constructed, consists of replicate samples over a 5-year period and across regions of the state. Reference conditions are a composite by which to compare study reaches, thereby limiting the variability associated with individual reference sites.

There is a high level of certainty about making an assessment of attainment of the aquatic life use at the 25^{th} percentile of reference condition. However, there is less certainty about making a determination of "impaired" when IBI scores fall just below the 25^{th} percentile. To avoid having false positive assessments of "impaired", a verification sample will be required when the IBI score falls within the zone of uncertainty between the 10^{th} and 25^{th} percentiles of reference condition (Table 2, Figure 1, Figure 2). A verification sample is needed when IBI scores fall in this range because reference sites at the lower end of the reference scale have some uncertainty in their quality.

Table 2. Assessments based on ADEQ macroinvertebrate IBI scores.

Macroinvertebrate bioassessment result	**Index of Biological Integrity Score**		**Assessment**
	Cold water	**Warm water**	
Greater than the 25th percentile of reference condition	≥ 90	≥ 59	Attaining
Between the 10th and 25th percentile of reference condition	86 – 89	53 – 58	Inconclusive
Less than the 10th percentile of reference condition	≤ 85	≤ 52	Impaired

When the IBI score for the verification sample falls below the 25th percentiles, we have evidence that the community is degraded and the study reach will be assessed as impaired for the aquatic life use. When the IBI score for the verification sample is greater than the 25th percentile confidence interval, there is sufficient evidence that the community is improving, therefore the study reach will be assessed as attaining the aquatic life use.

Listing

The same criteria as for determining a standards exceedance will be applied for water quality listing purposes. A waterbody will be placed on the 303(d) impaired waterbody list when the IBI score is less than the 10th percentile for a single sample. A waterbody will also be placed on the 303(d) list when an initial IBI score is found to be inconclusive (between the 10-25 percentiles) and a verification sample is found to be less than the 25th percentile. Placement of a waterbody on the 303(d) list and delisting it will be based on the most recent bioassessment. After being assessed as impaired, a waterbody can be delisted when a later bioassessment indicates that the surface water is no longer impaired.

Identification of the stressor that is causing impairment of the biological community will be conducted as part of a TMDL investigation. Detailed methods for conducting the stressor identification process are described in the USEPA's *Stressor Identification Guidance Document* (USEPA, 2000).

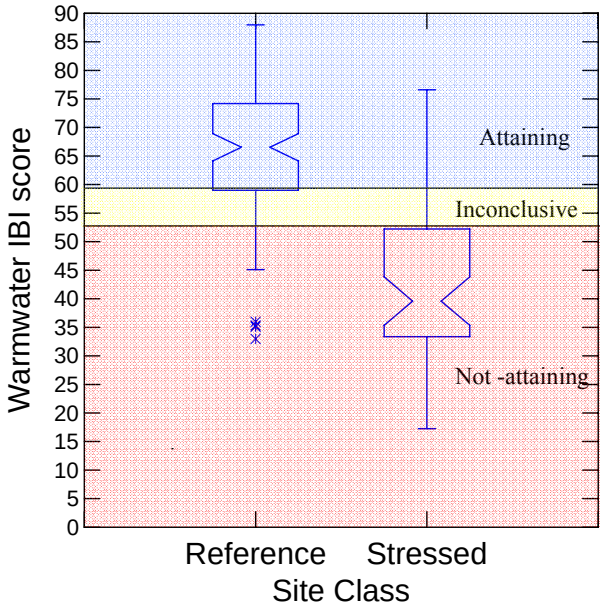

Figure 1. Warmwater assessment categories

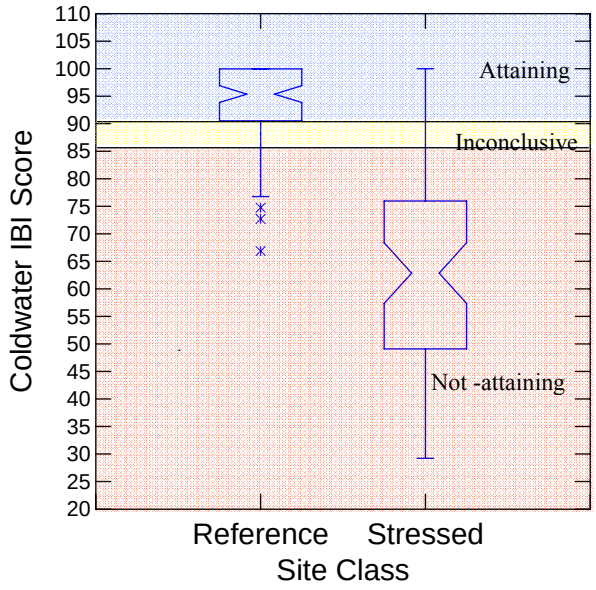

Figure 2. Coldwater assessment categories

Definitions:

Bankfull elevation: The channel elevation at which an annual high flow event with a 1-2 year return interval occurs. Bankfull elevation is estimated using regional curves and field measurements and several field indicators are identified to determine if recent high flows have occurred. These indicators are listed in the ADEQ Stream Ecosystem Monitoring field forms.

Bankfull flow means the discharge level in cubic feet per second, which corresponds to the annual high flow event having a return interval of 1-2 years. The"high flow checklist" in the SEM field forms is used to determine in the field whether a high flow has recently occurred.

Biological assessment (Bioassessment): An evaluation of the biological condition of a surface water using biological surveys of the resident living organisms.

Biological criteria (Biocriteria): Narrative expressions or numeric values that describe the reference biological integrity of aquatic communities inhabiting waters of a given designated aquatic life use.

Biological integrity (Biointegrity): The capacity of supporting and maintaining a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of the natural habitat of the region.

Effluent-dependent water: A surface water that consists of discharges of treated wastewater that is classified as an effluent-dependent water by the Director under R18-11-113. An effluent-dependent water is a surface water that, without the discharge of treated wastewater, would be an ephemeral water.

Ephemeral water means a surface water that has a channel that is at all times above the water table, and that flows only in direct response to precipitation.

Index of biological integrity means a multimetric tool used for assessing the condition of a biological community.

Intermittent surface water means a stream or reach of stream that flows continuously only at certain times of the year, as when it receives water from a spring or from another surface source, such as melting snow.

Macroinvertebrates are invertebrate animals that are large enough to be seen with the naked eye and have no backbone or spinal column; such as insects, snails and worms.

Metric means a characteristic of the biota which changes in some predictable way with increased human disturbance.

Perennial surface water means a surface water that flows continuously throughout the year.

Riffle habitat refers to the portions of streams where moderate velocities and substrate roughness produce moderately turbulent conditions which break the surface tension of the water and may produce whitewater.

Run habitat refers to segments of streams where there is moderate velocity water, but non-turbulent conditions which do not break the surface tension of the water and do not produce whitewater.

Spring index period means the time period following winter runoff and snowmelt, when baseflow conditions generally occur in Arizona streams. For macroinvertebrate sampling purposes, spring index period is defined as April 1-May 31st for warm water streams and May 1 – June 30th for cold water streams.

Study reach: A macroinvertebrate sample is collected over a stream segment that is 2 meander lengths long or a minimum of 100 meters long in larger streams. It represents biological integrity of the assessment unit within which it is collected.

Heterogeneous substrate means a mixture of particle sizes comprises the stream bottom material that is less than 50% dominated by travertine, bedrock or sand.

Wadeable means no deeper than can be safely waded across when collecting samples. ADEQ recommends sampling in streams that are flowing at velocities and depths whose quotient is less than 9 (eg. Velocity <4.5ft/s x 2 ft deep).

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Appendix A: Development of the Biocriteria Standard

Reference Conditions

The bioassessment approach involves characterizing reference conditions upon which comparisons can be made, then identifying appropriate biological attributes with which to measure the condition. A stream reach is in reference condition when ecological conditions and the associated biological diversity are greatest for a region. Reference site data provide a baseline from which to develop an index for assessment purposes.

In Arizona, regional reference conditions have been developed statewide; with 30-50 reference sites each for warm and cold water stream types. Locational, physical, chemical and biological data were collected for 5 years at these sites to quantify natural variability in macroinvertebrate communities and for index development purposes. Initially physical conditions were used to screen for reference sites, which were then confirmed using biological information. All the following conditions must be met to be considered reference:

- No known discharges upstream
- No major impoundments upstream
- No channel alterations at the site
- Located >0.5 km downstream of road crossings
- Site should be free of local land use impacts
- Site should be truly perennial (presence of fish, univoltine insects, riparian indicators)
- No violations of pH or dissolved oxygen water quality standards
- ADEQ Habitat score > 14
- Accessible (within a 2-hour hike or 3-4 mi from nearest road)

Reference site data alone is insufficient to test and calibrate a multimetric index. There must be some samples from stressed sites by which to discriminate reference from stressed and to help calibrate the index. Stressed sites included stream reaches which have one or more of the following criteria:

- Known discharges occur upstream
- Channel alterations occur upstream
- Substantial bank erosion occurs within the study reach
- Land use impacts are occurring adjacent to the stream
- Water quality standards are exceeded
- ADEQ Habitat score <14

With these data in hand, a variety of biological descriptors or metrics are tested to determine which ones best discriminate between reference and stressed conditions. These metrics are then aggregated to form a multimetric index of biological integrity.

Indexes of Biological Integrity

Multimetric Indexes of Biological Integrity (IBI) have been developed for many ecoregions of the country and are generally accepted as the assessment tool for use in biological assessments of aquatic communities. The USEPA publication, *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers* (Barbour et al, 1999) provides guidance on monitoring of biological communities and development of analytical tools, including multimetric indexes, for assessment purposes. ADEQ followed that guidance in development of multimetric Indexes of Biological Integrity for macroinvertebrate communities of Arizona.

These indexes consist of several metrics which were tested to determine which ones best distinguish between reference and impaired conditions, using a 5-year data collected during 1992-97. Approximately 30 metrics were tested for responsiveness to disturbance in four metric categories: richness, composition, tolerance and functional feeding groups. Metrics were selected for each index based on several criteria:

- Best discriminatory efficiency between reference and impaired sites,
- One metric chosen from each of the four metric categories,
- Minimization of redundancy among metrics, and
- Metrics responded to different types of stressors (Gerritsen and Leppo, 1998; Leppo and Gerritsen, 2000).

Those metrics having the strongest discriminatory power were selected for inclusion in the indexes. The metrics are calculated from a list of species and their abundances and the total IBI score is an average of the metric scores, on a scale of 0-100. Procedures for calculating the indexes are provided in Attachment A of the *Biocriteria Program Quality Assurance Program* (ADEQ, 2005).

The **cold water IBI** consists of the following seven metrics and is described in the *Biocriteria Program Quality Assurance Program (QAPP).* The metrics in bold differ between the cold and warm water indexes. While the cold and warm indexes share several metrics, they are scored differently due to different numbers and abundances of taxa in these habitats.

- Total taxa richness,
- Diptera taxa richness,
- **Intolerant taxa richness,**
- Hilsenhoff Biotic Index,
- **Percent composition by Plecoptera (stoneflies**),
- Percent composition by scrapers, and
- Scraper taxa richness.

The **warm water IBI** consists of the following nine metrics as described in the *Biocriteria Program Quality Assurance Program (QAPP).* The metrics in bold differ between the warm and cold water indexes.

- Total taxa richness,
- **Ephemeroptera taxa richness (mayflies),**

- **Trichoptera taxa richness (caddisflies),**
- Diptera taxa richness,
- **Percent composition of Ephemeroptera (mayflies),**
- **Percent composition by the dominant taxon,**
- Hilsenhoff Biotic Index,
- Percent composition by scrapers, and
- Scraper taxa richness.

Box and whisker plots and confidence intervals are analytical tools that are commonly used for determining statistical differences in bioassessment index development. An example boxplot (Figure 1) provides the statistical descriptions for items in the figure. The outline of the box is represented by the 25th and 75th percentiles of the distribution of values (the interquartile range) with the midpoint being the 50th percentile (median). The fences represent a statistical minimum and maximum, and points beyond that are considered outliers. The notch in the box represents the 95th percentile confidence interval around the median. When the intervals around the medians of two plots do not overlap, you can be confident at the 95% level that the two population medians are significantly different. In this way the boxplots represent a significance test.

These box plots are used to develop biological index scoring criteria. Box and whisker plots of IBI scores for reference stream communities and IBI scores for stream communities with known stressors were plotted together to identify statistical differences. The box and whisker plots for warm water stream communities (Figure 2) indicates that there is a distinct separation of the notches around the medians, representing a significant difference between the two groups of samples/sites. There is also a distinct separation between the two populations (reference and stressed) at the 25th percentile of the reference group of samples, which is well separated from the majority of the stressed samples, as represented by the 75th percentile of stressed sites. Typically in index development work, a statistic which represents a statistical difference between reference and stressed samples, and which is based on the reference distribution of scores is identified for use as a minimum threshold or biocriterion.

Many states' bioassessment programs have selected the 25th percentile of the reference condition as their biocriteria threshold, according to a USEPA document summarizing the status of biocriteria programs across the nation (USEPA, 2002b). In fact, the 25th percentile of reference threshold is the most commonly used threshold, in use by 11 of 28 states which use a multimetric index and have developed some scoring criteria (USEPA, 2002b). We selected the 25th percentile of the reference boxplot to be used as the minimum scoring threshold needed to attain the aquatic life use, because a significant difference occurred between the reference and stressed biological communities at that threshold level (Figure 2).

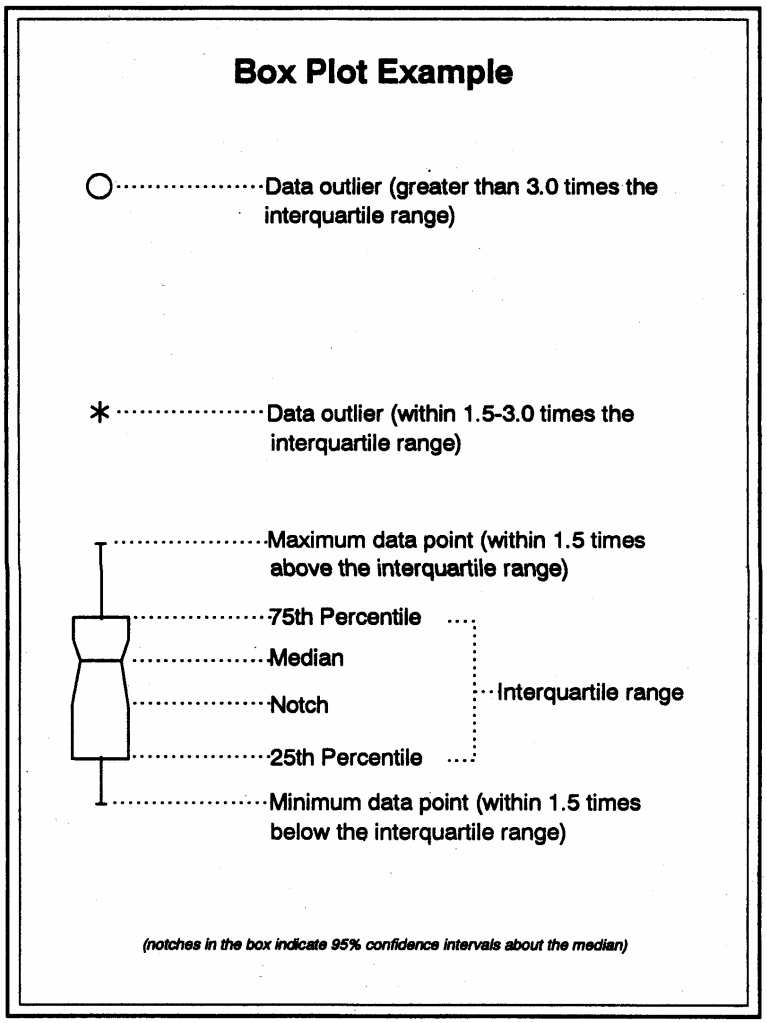

Figure 1. Example box plot figure.

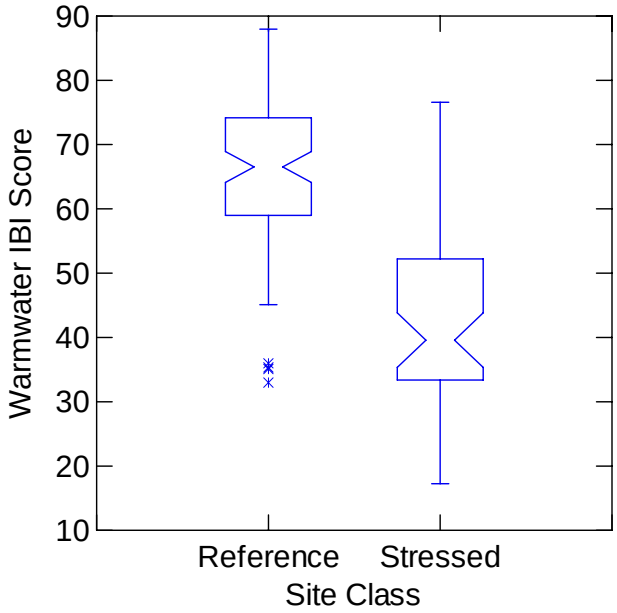

Figure 2. Box plot of Arizona warm water IBI scores in reference and stressed classes of sites, 1992-2003.

The box and whisker plots for cold water stream communities (Figure 3) also reveal a distinct separation of the notches around the medians, representing a significant difference between the two groups of samples/sites. There is also a distinct separation between the two populations (reference and stressed) at the 25th percentile of the reference group of samples, which is well separated from the majority of the stressed samples (eg. 75th percentile of stressed sites). As in the warm water index, the 25th percentile of the reference boxplot was selected for the minimum scoring threshold needed to attain the aquatic life use.

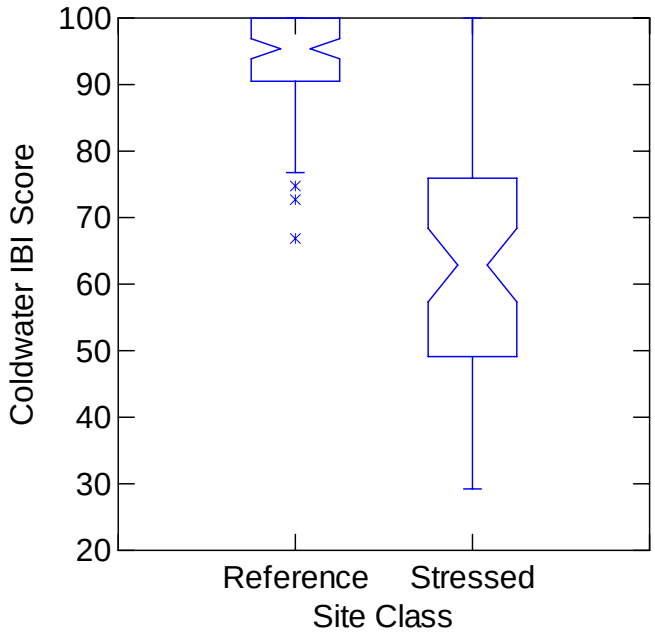

Figure 3. Box plot of Arizona cold water IBI scores in reference and stressed classes of sites, 1992-2003

Appendix B: SEM Field Form, Macroinvertebrate Sample Collection

Decision Criteria for Sampling Macroinvertebrates		
The target stream habitat for collecting macroinvertebrates must be wadeable, perennial, contain riffle habitat, contain heterogeneous substrates, and must be sampled during the spring index period. Spring index period is April - May for warm water streams and May - June for cold water streams. Use the following specific decision criteria to determine whether to collect a macroinvertebrate sample. Where you have found the stream conditions to be inappropriate for macroinvertebrate sampling, circle the reason or record a comment indicating the rationale for not collecting.		
Item	**Condition**	**Action to Take**
Bankfull or Extreme Flood	Baseflow conditions occurring approximately 4 or more weeks after a bankfull flow event is the target sampling condition. Using known watershed area, use appropriate Regional Curve and field bankfull indicators to estimate bankfull elevation. Look for high flow indicators at or below this elevation as an indicator of a bankfull flow event.	Collect macroinvertebrates
	A bankfull magnitude flow event has recently occurred.	Do not collect
Substrate Type	A substrate consisting of a mixture of some of the following particle sizes is the target condition: boulder, cobble, gravel, sand, clay, silt, bedrock.	Collect macroinvertebrates
	Streams which have substrates dominated (consisting of >50% of that substrate type) by bedrock, travertine, or sand are considered non-target conditions.	Do not collect
Waterbody Type	The target waterbody type is a flowing stream with riffle or run (erosional) habitats present.	Collect macroinvertebrates
	We do not have methods developed for the following waterbody types and are not sampling them at this time: Effluent dependent streams, wetlands, ephemeral streams, lakes, seasonally intermittent streams.	Do not collect
Comments: (indicate rationale for not collecting macroinvertebrate sample, if different from the above descriptions)		